CLAIMS:

1   1.   A method of predicting the occurrence of critical events in a
2   computer cluster having a series of nodes, said method comprising:
3   maintaining an event log that contains information concerning critical
4   events that have occurred in the computer cluster;
5   maintaining a system parameter log that contains information
6   concerning system parameters for each node in the cluster; and
7   predicting a future performance of a node in the cluster based upon
8   said event log and said system parameter log.

1   2.   The method of claim 1 comprising developing a Bayesian network
2   model that represents said computer cluster and said nodes based upon the
3   information in said event log and said system parameter log.

1   3.   The method of claim 1 wherein maintaining said system parameter
2   log comprises recording a temperature of a node in the cluster and a
3   corresponding time value.

1   4.   The method of claim 1 wherein maintaining said system parameter
2   log comprises recording a utilization parameter of a central processing unit of
3   a node in the cluster and a corresponding time value.

1   5.   The method of claim 1 comprising filtering said event log and said
2   system parameter log such that some critical event information and some
3   system parameter information is not maintained in said event log and said
4   system parameter log.

1   6. The method of claim 1 comprising using a time-series mathematical

2   model to predict future values of said system parameters.

1   7. The method of claim 1 comprising using a rule based classification

2   system to predict future critical events based upon said critical event

3   information and said system parameter information.

1   8. The method of claim 1 wherein the step of predicting comprises

2   forming a warning window for each node in the cluster such that said warning

3   window contains a predicted performance parameter or critical event

4   occurrence for the node for a predetermined future period of time.

1   9. A method of improving the performance of a computer cluster having

2   a series of nodes comprising:

3   monitoring the occurrence of critical events in said nodes in said

4   computer cluster;

5   monitoring system performance parameters of said nodes in said

6   computer cluster;

7   creating a node representation for each node in said computer cluster

8   based upon said monitoring;

9   creating a cluster representation based on said node representations;

10   periodically examining said node representations to predict future node

11 performance; and

12   using said cluster representation to redistribute tasks among said nodes

13 based upon said predicted node performance.

1   10. The method of claim 9 wherein creating said cluster representation

2   and said node representation comprises creating a Bayesian Network that

3   represents relationships between the occurrence of said critical events and

4   said system performance parameters.

1   11. The method of claim 9 comprising saving information concerning

2   said critical events and said system performance parameters in a database.

1   12. The method of claim 11 comprising filtering said saved information

2   to remove information wherein said removed information is not determined to

3   be useful in predicting a future performance of said nodes.

1   13. The method of claim 9 comprising applying a time-series

2   mathematical model to said system performance parameters to predict future

3   values of said system performance parameters.

1   14. The method of claim 13 wherein said time series mathematical

2   model is one of an auto regression, a moving average and an autoregressive

3   moving average model.

1   15. The method of claim 9 comprising using rule based classifications

2   to associate some system performance parameters with occurrence of said

3   critical events.

1   16. The method of claim 9 wherein said system performance

2   parameters concern at least one of a node temperature, processor utilization

3   value, network bandwidth and available memory space.

1   17. An information processing system comprising:

2   a computer cluster having a series of nodes;

3   a control system for monitoring critical events that occur in said

4 computer cluster and system parameters of said nodes;

5   a memory for storing information related to said occurrence of said

6 critical events and said system parameters of said nodes; and

7   a Bayesian Network model for predicting a future occurrence of a

8 critical event based upon an observed relationship between said system

9 parameters and said occurrence of critical events.

1   18. The information processing system of claim 17 comprising a filter

2 for removing redundant information from said stored information.

1   19. The information processing system of claim 17 wherein said

2 Bayesian Network comprises a time-series modeler for predicting future

3 values of said system parameters.

1   20. The information processing system of claim 17 wherein said

2 Bayesian Network comprises a rule based classification system for associating

3 said system parameters with said occurrences of said critical events.

1   21. The information processing system of claim 17 comprising a

2 dynamic probe generator for determining when to collect additional information

3 concerning said system parameters or said critical event occurrence.